25th ANNUAL NATIONAL CONFERENCE ON MANAGING ENVIRONMENTAL QUALITY SYSTEMS

APRIL 24-27, 2006

Marriott Renaissance, Austin, Texas

Technical Papers

Workshop: Avoiding Statistical Pitfalls in Environmental Science

- D.Crumbling, S. Dyment, M. Moore, Getting the Right Statistical Answers for Contaminated Sites - 10:30 AM

TECHNICAL SESSION:
Workshop: Avoiding Statistical Pitfalls in Environmental Science

Getting the Right Statistical Answers for Contaminated Sites

Instructors: Deana Crumbling, Stephen Dyment (USEPA Office of Solid Waste and Emergency Response) and Marlene Moore (Advanced Systems, Inc.)*

** Corresponding author (crumbling.deana@epa.gov, 703-603-0643)*

This workshop will expand upon the concepts introduced in the accompanying proposed platform talk: Avoiding Pitfalls When Applying Statistics to Contaminated Sites.

Although EPA's guidance recommends using classical statistics to predict the number of site samples and to assess the quality of chemical concentration data, questions can be raised:
Given what is now known about release mechanisms and behavior of contamination, are classical statistics the correct model for site characterization and cleanup tasks?
Does dependence on quantitative statistical procedures support decision quality and foster efficient cleanups?

What knowledge is required to apply statistical software (such as VSP) correctly?
How can project planning and oversight staff be trained to avoid and detect statistical pitfalls and misapplication of statistical software?

Topics to be covered include:

- The physical and societal inputs to a conceptual site model and the role of professional judgment in hypothesis testing
- De-mystifying sample representativeness:
- Understanding scales of heterogeneity, contaminant distributions, and data result extrapolation
- Detecting different on-site populations
- Using decision-driven populations for maximum project cost-effectiveness
- How valid are assumptions of constituent randomness and independence?
- Why classical statistics predicts the same number of samples no matter whether it is a 1-acre or 1000-acre site.
- Using software to assessing "bulk" data sets in a vacuum invites trouble.
- Don't just throw out those outliers!
- Applying VSP and other software as "black-boxes" is dangerous.
- New characterization and cleanup technologies and strategies reduce the need to "force-fit" statistical models to site cleanup.